Effects of Climate Change on Philippine Marine Resources: Fisheries and Biodiversity

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Outline of presentation:

- Status of fisheries and biodiversity
- Potential effects of Climate Change
  - Spatial and temporal distribution
  - Migration and dispersal potentials
  - Physiological tolerance
  - Disruption of functional interactions and ecosystem services (e.g. provisioning)
  - Can lead to further decline of conditions of fisheries and loss of biodiversity
- Role of BMB
  - Protection and management of coastal and marine ecosystems (resilience and productive)
  - Coordination with other government agencies
  - Provide science and evidence-based policies

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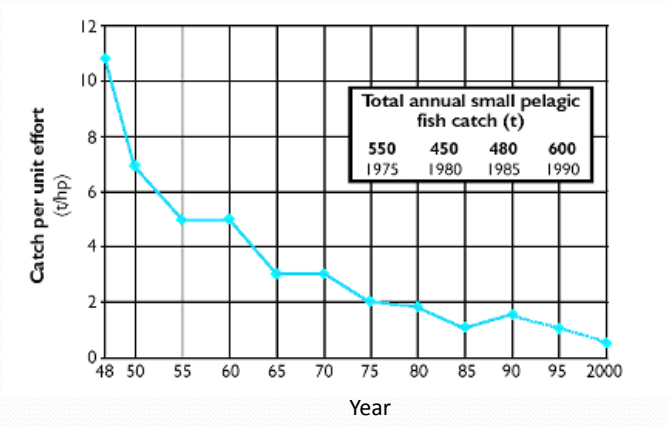
Trend of CPUE



Trend of catch per unit effort since 1948 (Dalzell et al 1987) Silvestre and Pauly 1989; Dalzell and Corpuz 1990; BFAR 1997, Campos 2004)
Source: http://www.oneocean.org/flash/the_philippine_seas.html

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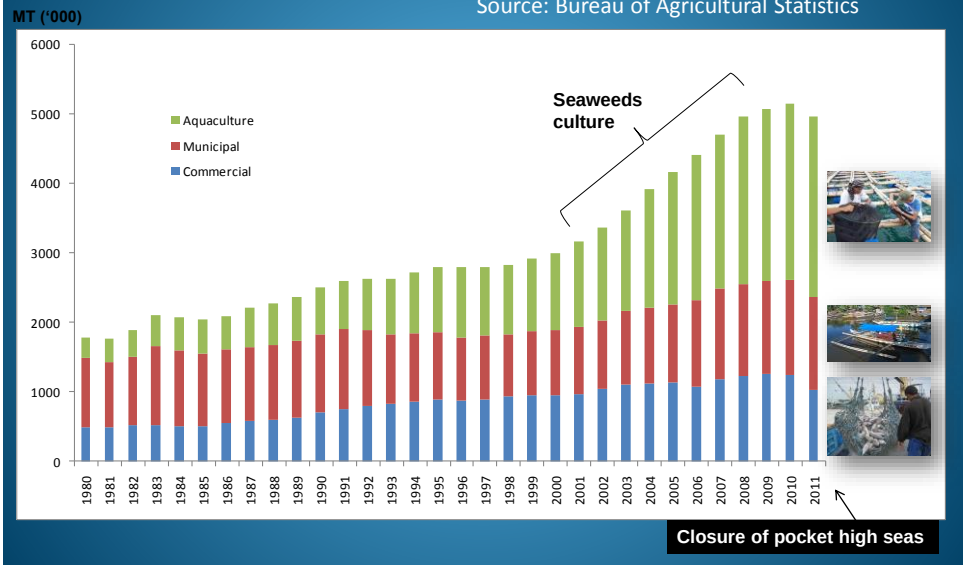
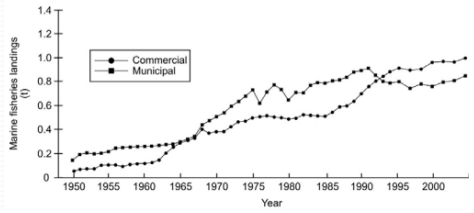
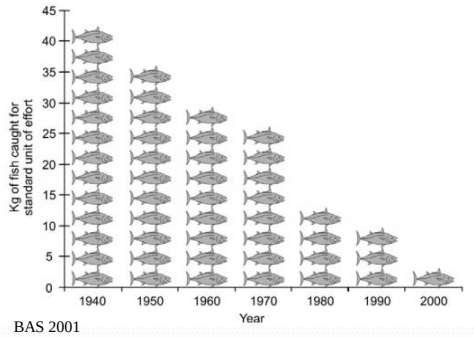
Not so good news: Philippine fisheries production trends

Source: Bureau of Agricultural Statistics



Status of fisheries in the Philippines





BAS 2001

- While CPUE has been in a steep decline, marine capture fisheries landing for both commercial and municipal fishing increase over time
- This can only be possible by:
  - Increasing fishing effort
  - Shifts in catch composition from more valued to less valued fish

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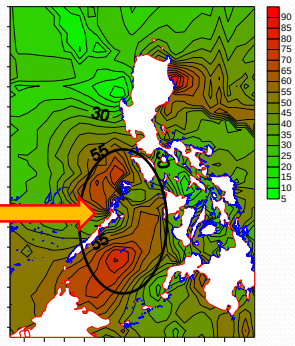
Not so good news: Resources in decline

Resource/ Habitat	Status	Source
Corals	*Degraded state*	BFAR-NFRDI-PAWB. 2005. BINU
Seaweeds	*Unknown (except declining seed source)*	-do- GTZ. 2009.
Seagrasses	*Heavily stressed*	BFAR-NFRDI-PAWB. 2005. BINU
Mangroves	*Degraded state*	-do-
Invertebrates	*Declining trend*	-do-
Demersal fishes	*Declining trend*	-do-
Small pelagic fishes	*Declining trend*	-do-
Tunas	*Stable trend (except Bigeye tuna)*	WCPFC. 2009
Sharks and rays	*Declining trend*	NPOA Sharks. 2009
Marine turtles	*Threatened*	BFAR-NFRDI-PAWB. 2005. BINU
Marine Mammals	*Threatened*	IUCN Red List. 2009

Fish biodiversity declines
in the center of the center,
the Philippines → the Visayan Seas



Interpolated species diversity map of fish species in the Philippines from fish visual census data (1990s to 2008) (* Nañola et al, 2010)

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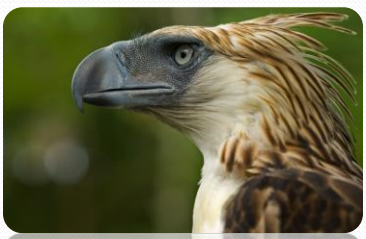
PHILIPPINE BIODIVERSITY

- The Philippines is one of the **18 megadiverse** countries in the world
- They host some **70 percent** of the world's **biodiversity resources**



Partnerships for Biodiversity Conservation: Mainstreaming in Local Agricultural Landscapes
Conserving Biodiversity to Promote Inclusive Economic Growth

BIODIVERSITY PARTNERSHIPS

Vulnerability of Philippine Amphibians to Climate Change (Alcala et al. 2012)

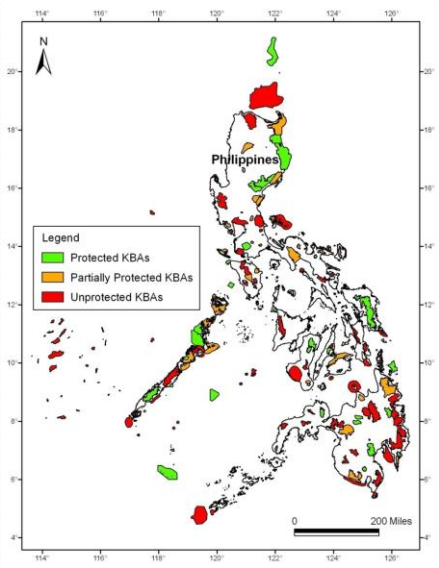
- ***Assessment based primarily on known reproductive modes, microhabitats, (including altitudinal distributions)***

Vulnerability of Philippine Amphibians to Climate Change (Alcala et al. 2012)

- ***26 species (24.30%) highly vulnerable***
- ***48 species (44.86%) moderately vulnerable***
- ***27 species (25.23%) vulnerable***
- ***6 species (5.61%) least vulnerable***

Key Biodiversity Areas

- 128 Terrestrial and freshwater
- 123 Integrated marine KBAs
  - Corals
  - Mollusks
  - Elasmobranchs
  - Echinoderms
  - Reef fish
  - Marine turtles
  - Marine reptiles
  - Seabirds
  - Marine mammals
  - Marine plants



Ambal 2014 @ www.fpe.ph/biodiversity

Status of fisheries and biodiversity in the Philippines

- Philippine fisheries resources is in a decline
  - Current CPUE is less than 0.05 that 52 Years ago
  - Shifts in catch composition to less valued species (e.g. from finfish to seaweeds, from lapu-lapu to sap-sap)
  - Overall sizes of catch is smaller (average size of many catches are below size at sexual maturity)
  - Need to fish farther away

- Philippine biodiversity is very rich BUT threatened
  - While we are regarded as a center of the center of biodiversity, we are a global hotspot
  - A long list of threatened species (fauna and flora)
  - Need to actively protect and maintain biodiversity

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Drivers and threats to fisheries and biodiversity

- Overexploitation
- Destructive fishing methods (Illegal, Unregulated and Unreported Fishing)
- Habitat loss (e.g. coral reefs, seagrass beds, mangroves, mudflats)
- Pollution (e.g. sedimentation, wastes and chemicals, plastics)
- Invasive Alien Species
- Burgeoning population
- Weak political will

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Major threats of Climate Change

- Sea level rise
- Warming of the seas
- More intense weather disturbances
- Ocean acidification
- Low lying coastal communities (e.g. mangroves)
- Disruption of cues for many animals
- Coral bleaching
- Disasters (e.g. Yolanda)
- Drought
- Extreme weather conditions
- Skeleton forming animals are threatened

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Sea level rise

- Can lead to boundary shift of ecosystems leading to fragmentation (e.g. prolonged inundation of mangrove species landwards)
- Low lying communities coastal communities are highly vulnerable (e.g. CAMANAVA)
- Lead to coastal instability

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Warming of seas

- Spatial and temporal distribution of species
  - Tropical species move to higher latitudes to escape warming of sea waters
- Coral bleaching
  - Loss of habitat
  - Shifts in species composition and trigger cascading changes
    - Species interaction
    - Ecosystem functions and services
  - From coralline communities to algal communities
  - From balance trophic groups to more herbivores

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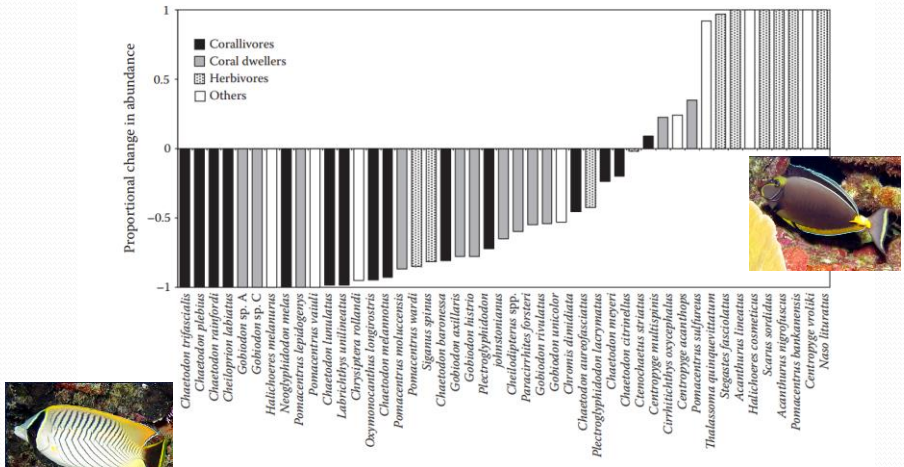
Status of fisheries resources affected by effects of climate change…



Effects of coral bleaching – climate change related disturbance

Pratchett et al. 2008

Photos source: www.reefguide.org/indopac

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More intense weather disturbances

- Calamities
- Coastal ecosystems are vulnerable
  - Coral reefs decimated (e.g. Apo Island)
  - Mangroves severely affected
- Studies have shown that these communities recover better naturally –keep them protected from human extractive activities

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Ocean acidification

- Ability of lifeforms to produce shells, skeleton and calcareous protective structures will be compromised
  - Corals
  - Mollusks
  - Fish
  - Calcareous algae and plants
  - Tests of plankton
- This is more scary because ocean acidification affects all
- Hence, halt all factors leading to ocean acidification

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Role of the Biodiversity Management Bureau, DENR

- Lead in the protection and management of coastal and marine resources
  - Communication, education and public awareness (CEPA)
  - Development of science and evidenced based policies
  - Coordination with other government agencies and sectors

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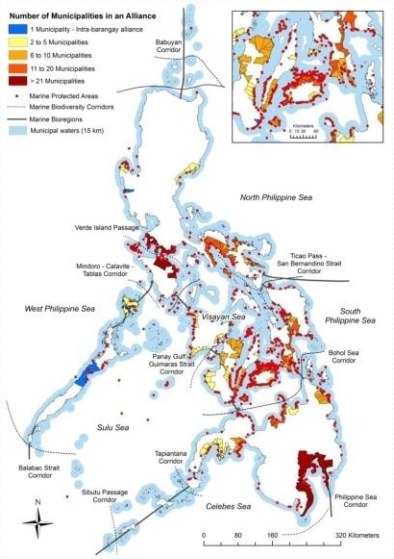
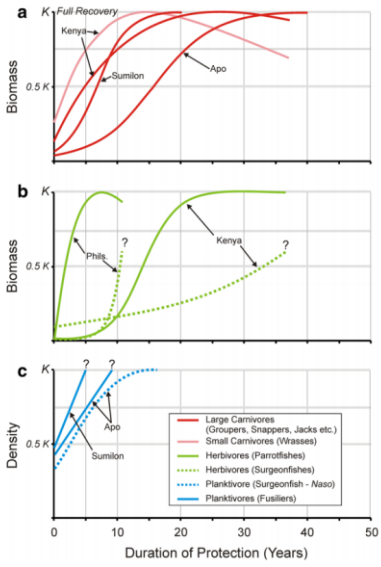
Management interventions (BMB actively supports)…

- 40 alliances
- 270 cities and municipalities
- 484 existing MPAs; approx. 81,500 ha
- Varies in size (# & area), governance arrangements, objectives
- Only 24% are active (meeting regularly)



Horigue et al. 2014.

Support to MPAs as tools to aid recovery of fishery



Abesamis et al. 2014.

BMB is proposing Coastal and Marine Ecosystems Rehabilitation Program…

- National program targeting all coastal and marine ecosystems (coral reefs, mangroves, seagrass, mudflats and other support systems)
- Programmed from 2017-2028
- Focus on:
  - Reduction of threats and drivers of degradation
  - Rehabilitation of ecosystems in priority areas
  - Effective management of coastal and marine ecosystems
  - Improve the quality of life of the people
- Projected cost is around 202 B over 12 years
- It will arrest decline of ecosystems and double the total potential economic value of resources

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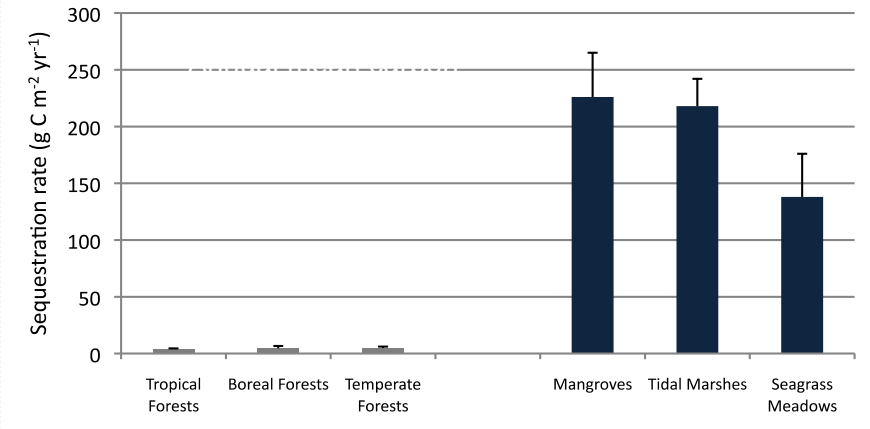
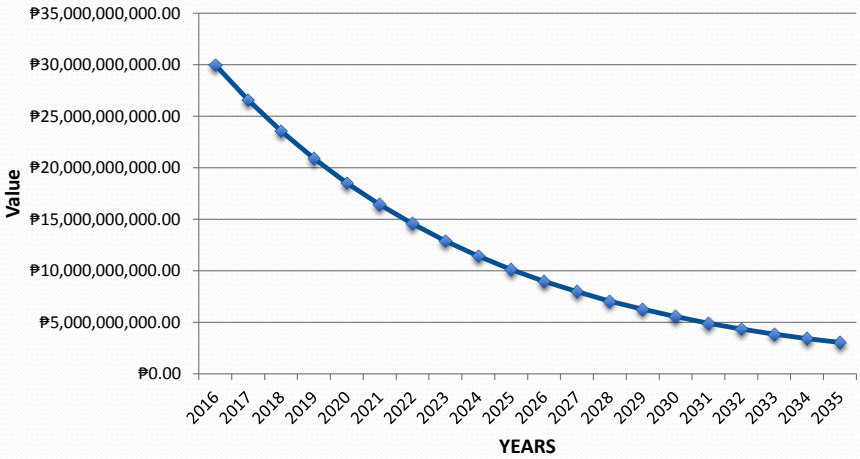
High efficiency of coastal ecosystems in their carbon sequestration function



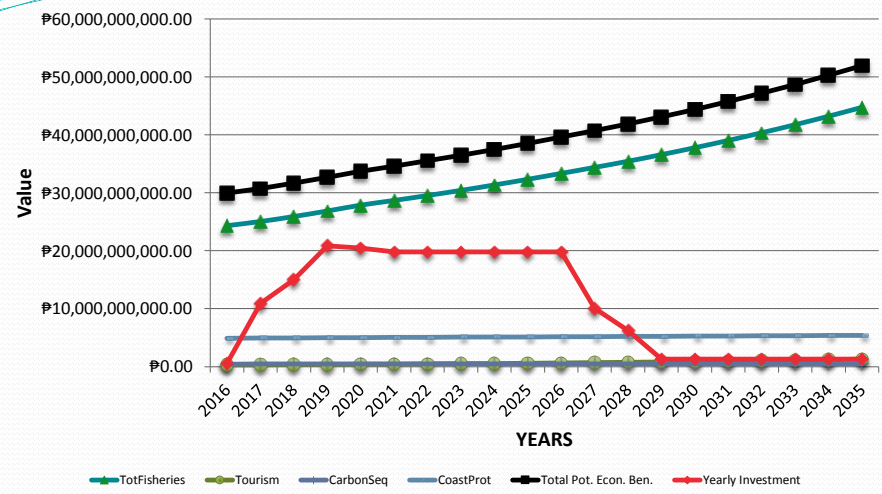
(Modified from McLeod et al. 2011)

If we do NOTHING…



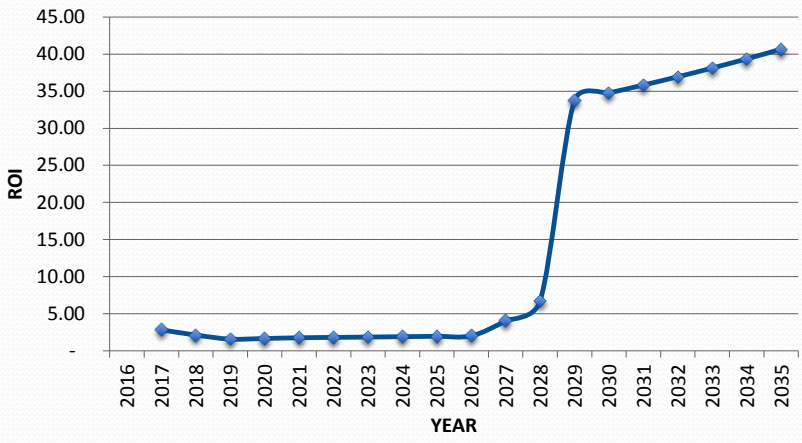
Total Potential Economic Value of our coastal and marine ecosystems will decline nearly 90% in 20 years!

Linear Projections of Economic Benefits Accruing from Improved C and M Ecosystems



With direct intervention and proper maintenance and protection, we can consistently increase and double the Total Potential Economic Benefit of our coastal and marine ecosystems!

Projected Yearly Return on Investment



Mean ROI = 15.24 in 20 years

Thank you!